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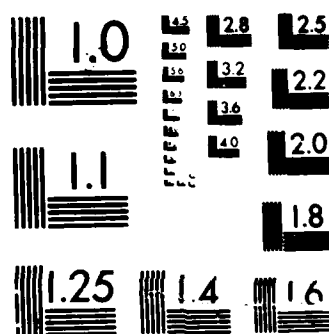
FREE TEXT VERSUS UNCONTROLLED VOCABULARY: A PERFORMANCE 1/1
COMPARISON(U) DEFENSE TECHNICAL INFORMATION CENTER
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FREE TEXT VERSUS UNCONTROLLED VOCABULARY

A PERFORMANCE COMPARISON

Thomas F. Lahr

Defense Technical Information Center

Information Science Intern Program

24 December 1980

DTIC
ELECTE

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BACKGROUND

The objective of this study is to evaluate the retrieval effectiveness of the Technical Reports (TR) database of the Defense RDT&E On-Line System (DROLS) when a free text generated index file is used instead of indexer assigned uncontrolled vocabulary.

The documents in the Technical Reports database are assigned various posting terms from the thesaurus or controlled vocabulary (DTIC Retrieval and Indexing Terminology-DRIT). In addition, indexers have the option of assigning terms not found in the controlled vocabulary which are known as identifiers or open-ended terms.

These terms have historically been assigned along with the controlled vocabulary, to pick up topics where a main idea or concept of a report is not covered in the thesaurus. An identifier was assigned to describe a very specific item, usually an alpha-numeric, which would represent a project, code name, equipment model number, etc. Examples of identifiers are: F 104 Fighter, AN/SPS-39, and Plumbob Project. Open-ended terms have been assigned to describe new technology or concepts, acronyms, author suggested terms, etc. Previously a distinction was made in the database as to whether a term was an identifier or an open-ended term, but currently they are both labelled as identifiers in the Technical Reports file.

-1-



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The free text file in the TR database contains single words taken from the titles and abstracts and are directly searchable. The free text inverted file consists of:

- (1) Alphabetic, alphanumeric or numeric strings of characters up to 60 characters in length.
- (2) All special characters (commas, periods, slash marks, colons, etc.) are converted to blanks which serve as term delimiters.
- (3) A term which is present on the stop word list is discarded (see Attachment A).

As an example, the following Technical Report abstract will provide the listed free text terms.

A SELECTIVE DETECTION SCHEME FOR ATOMS IN THE METASTABLE 2S STATE OF HYDROGEN THAT PROVIDES THE HIGH SPATIAL RESOLUTION (0.1 CM) NECESSARY FOR TIME-OF-FLIGHT ATOMIC BEAM STUDIES IS DESCRIBED. THE SCHEME UTILIZES THE LYMAN PHOTON EMITTED WHEN THE METASTABLE IS DE-EXCITED IN AN ELECTRIC FIELD VIA THE STARK EFFECT. DETAILS OF CONSTRUCTION AND OPERATION ARE DISCUSSED.

SELECTIVE	FLIGHT	STARK
DETECTION	ATOMIC	DETAILS
SCHEME	BEAM	CONSTRUCTION
ATOMS	STUDIES	OPERATION
METASTABLE	DESCRIBED	DISCUSSED
2S	SCHEME	
HYDROGEN	UTILIZES	
PROVIDES	LYMAN	
HIGH	PHOTON	
SPATIAL	EMITTED	
RESOLUTION	METASTABLE	
0	DE	
1	EXCITED	
CM	ELECTRIC	
NECESSARY	FIELD	
TIME	VIA	

This report will assess the retrieval effectiveness of specific terms searched in both the free text system and as identifiers/open-ended terms using the records for 150,000 entries in the Technical Reports data base.

METHODOLOGY

A collection of terms was put together which are felt to be representative of typical terms that a DROLS user might come up with during a search, not found in the DTIC Retrieval and Indexing Terminology. A total of 212 terms were chosen to be searched. Of these, 100 to 125 were chosen from the "Combined Frequency Count" which is a multivolume, alphabetical listing of DRIT terms and identifiers, along with their frequency of occurrence in the DROLS databases. These specific words were used in order to assure a number of search terms with known hits as identifiers in the Technical Reports file. In contrast to this, approximately 75 to 100 words or word phrases were chosen without reference to the "Combined Frequency Count". Most of them relate in some way to the subject content of the TR database. Also included is a sampling of subject areas not normally connected to the Department of Defense, but which may be representative of certain needs of DROLS users, and of which research may have been performed by DoD.

The test was done on each individual term (a term may be one or more words, or alphanumerics, not found in the DRIT) not on specific searches, strategies, or combination of terms.

After the approximately 200 search terms were chosen, they were individually searched in the Technical Reports database using the terms as indexer assigned keywords. Since the free text file was only loaded for a certain set of AD (Accessioned Document) number ranges (AD900000-AD924000, ADA000001-ADA075000, ADB000001-ADB045000), the searches were

limited to those ranges only. It was decided that terms having up to 15 hits would be included in the relevancy check. Occurences greater than 15 were included in the overall totals, but not in the relevancy count. Bibliographies were ordered for the search terms with up to 15 hits. All bibliographies were then checked for relevancy to the term searched. If there were any questions as to the relevancy of a specific item, a copy of the document itself was reviewed and rated. All items in each bibliography were designated as relevant, marginally relevant, or not relevant.

Searches of the same terms were done on the free text file. Terms containing more than one word were searched using the Boolean operator "AND" (in the keyword system they had been searched on one level as a single multiword index term). A term such as AGENT ORANGE would be searched in the following manner:

As an identifier-

```
@STR@  
AGENT ORANGE  
END
```

In the free text file-

```
@STR@  
AGENT  
AND  
ORANGE  
END
```

In the free text test, if a search term resulted in more than 15 hits, a qualifying search was done, performing a text scan on the hits.

This utilized the ability to string search (search based on the physical relationship of the words in the term). Text scan was done only if the term had more than one word or alphanumeric grouping in it. Single words were not qualified by string searching. Bibliographies were then ordered for those terms having 15 hits or less.

Again, all the bibliographic references for each term were checked for relevancy to the term searched, and each item was designated as relevant, marginally relevant, or not relevant. In any instances where the relevancy was in doubt, a copy of the document itself was looked at and checked. Relevancy statistics are presented only for terms having 15 or less hits in both the identifier and free text systems.

RESULTS

The 212 terms searched produced a total of 334 hits as identifiers, and 5998 hits in the free text system (this was reduced to 3930 hits after string searching of multiple word terms). Of these, 52 terms (24.53%) had no hits in either system and 38 terms (17.92%) had greater than 15 hits in both systems and therefore not checked for relevancy.

Of the 212 terms, slightly greater than 50% (122 terms) provided a number of hits (0-15) which were then checked for relevancy. Twelve terms produced hits as identifiers, with no hits in the free text system. Forty eight terms had hits in the free text, with none as identifiers. Sixty two terms resulted in hits in both systems. In totaling these up for the relevancy count, the 122 terms searched as identifiers resulted in 187 hits, and in the free text system 596 hits. The 187 hits from the identifier searches consist of 103 that were determined to be relevant (55.08%), 73 that were marginally relevant (39.04%), and 11 hits not relevant (5.88%). In the 596 free text hits, 313 were found to be relevant (52.53%), 217 marginally relevant (36.41%), and 66 hits not relevant (11.07%).

DISCUSSION

The conclusion that one can draw from the results of the test is that the use of the free text searching produces approximately three times as many hits as using identifiers/open-ended terminology, with only a slight (2.5%) decrease in the relevancy of the items retrieved. There are instances of items not found in the controlled vocabulary where the use of free text is beneficial, such as variant spellings and word forms, alphanumerics, chemical terminology, foreign names, proper names, etc. The free text searching technique becomes an additional means for the search analyst to augment the search performance of the system. It allows the searcher to get at specifics that the controlled vocabulary does not directly address. Naturally, there are terms that one would not normally use in a free text system, where use of the controlled vocabulary and a defined search strategy would be necessary to narrow down the results. In this study, some of the searches that were not checked for relevancy, because the results numbered in the hundreds, would have to be further defined using search alternatives and perhaps some of them would not necessarily be searched using free text. Free text searching provides a viable alternative to the use of uncontrolled vocabulary and in any retrieval system can prove to be a valuable tool.

ATTACHMENT A

TEST STOP WORDS IN THE TECHNICAL REPORT DATA BASE

A	CAN	HOW
ABOUT	CANNOT HOWEVER	HOWEVER
ACCORDINGLY	CERTAIN	IF
AFFECT	CERTAINLY	IMMEDIATELY
AFFECTED	CFRD	IMPORTANCE
AFFECTION	COPYRIGHT	IMPORTANT
AFFECTS	COULD	IN
AFTER	CRD	INTO
AGAIN	DID	IS
AGAINST	DIFFERENT	IT
ALL	DO	ITS
ALMOST	DOES	ITSELF
ALREADY	DONE	JUST
ALSO	DUE	KEEP
ALTHOUGH	DURING	KEPT
ALWAYS	EACH	KG
AMONG	EFFECT	KM
AN	EFFECTS	KNOWLEDGE
AND	EITHER	LARGELY
ANOTHER	ELSE	LIKE
ANY	ENOUGH	MADE
ANYONE	ESPECIALLY	MAINLY
APPARENTLY	ETC	MAKE
ARE	EVER	MANY
ARISE	EVERY	MAY
AS	FOLLOW	NG
ASIDE	FOLLOWING	MIGHT
AT	FOR	ML
AUTHOR	FOUND	MORE
AWAY	FROM	MOST
BE	FURTHER	MOSTLY
BECAME	FY	MUCH
BECAUSE	GAVE	MUG
BECOME	GETS	MUST
BECOMES	GIVE	NEARLY
BEEN	GIVEN	NEARLY
BEFORE	GIVING	NECESSARILY
BEING	GONE	NEITHER
BETWEEN	GOT	NEXT
BOTH	HAD	NO
BRIEFLY	HARDLY	NONE
BUT	HAS	NOR
BY	HAVE	NORMALLY
C	HAVING	NOS
CAME	HERE	NOT

TEST STOP WORDS (cont.)

NOTED	SAME	THROUGHOUT
NOW	SEEM	TO
OBTAIN	SEEN	TOO
OBTAINED	SEVERAL	TOWARD
OF	SFRD	U
OFTEN	SHALL	UNDER
ON	SHOULD	UNLESS
ONLY	SHOW	UNTIL
OR	SHOWED	UP
OTHER	SHOWN	UPON
OUGHT	SHOWS	USE
OUR	SIGNIFICANTLY	USED
OUT	SIMIALR	USEFULLY
OVERALL	SIMILARLY	USEFULNESS
OWING	SINCE	USING
PARTICULARLY	SLIGHTLY	USUALLY
PAST	SO	VARIOUS
PERHAPS	SOME	VERY
PLEASE	SOMETIME	WAS
POORLY	SOMEWHAT	WERE
POSSIBLE	SOON	WHAT
POSSIBLY	SPECIFICALLY	WHEN
POTENTIALLY	SRD	WHERE
PREDOMINANTLY	STATE	WHETHER
PRESENT	STATES	WHICH
PREVIOUSLY	STRONGLY	WHILE
PRIMARILY	SUBSTANTIALLY	WHO
PROBABLY	SUCCESSFULLY	WHOSE
PROMPT	SUCH	WHY
PROMPTLY	SUFFICIENTLY	WIDELY
QUICKLY	THAN	WILL
QUITE	THAT	WITH
RATHER	THE	WITHIN
READILY	THEIR	WITHOUT
REALLY	THEIRS	WOULD
RECENTLY	THEM	YES
REGARDING	THEN	YET
REGARDLESS	THERE	
RELATIVELY	THEREFORE	
RESPECTIVELY	THESE	
RESULTED	THEY	
RESULTING	THIS	
RESULTS	THOSE	
S	THOUGH	
SAID	THROUGH	

ATTACHMENT B-TOTALS, STATISTICS AND RELEVANCY

TOTALS

	HITS	PERCENTAGE
212 Terms Searched	6332	
Identifiers/Open-ended	334	5.27%
Free Text	5998	94.73%
After string search of 30 of the 212 terms (in free text only)	4264	
Identifiers/Open-ended	334	7.83%
Free Text	3930	92.17%

STATISTICS

	HITS/TERM	PERCENTAGE
52 Terms		24.53%
Identifiers/Open-ended	0	
Free Text	0	
38 Terms		17.92%
Identifiers/Open-ended	GT 15	
Free Text	GT 15	
122 Terms Checked for Relevancy		57.55%
Identifiers/Open-ended	0-15	
Free Text	0-15	
(a) 12 Terms		5.66%
Identifiers/Open-ended	1-15	
Free Text	0	
(b) 48 Terms		22.64%
Identifiers/Open-ended	0	
Free Text	1-15	
(c) 62 Terms		29.25%
Identifiers/Open-ended	1-15	
Free Text	1-15	

RELEVANCEY

	HITS/TERM	HITS TOTAL	PERCENTAGE
122 TERMS		783	
Identifiers/Open-ended	0-15	187	23.88%
103 Hits relative			55.08%
73 Hits marginally relative			39.04%
11 Hits not relative			5.88%
Free Text	0-15	596	76.12%
313 Hits relative			52.53%
217 Hits marginally relative			39.04%
66 Hits not relative			11.07%

ATTACHMENT C-TERMS

T E R M	HITS	REL	MARG	NOT	HITS	STRING	REL	MARG	NOT
155 MM HOWITZERS	0				14		5	6	3
ACETAMETAPHYN	0				0				
AGENT ORANGE	0				3			1	2
AIRCRAFT PICKETING	0				0				
AN/GSQ-120	3	2	1		3		3		
AN/SPS-39	3		2	1	2			2	
AN/TSW	1	1			12		12		
APERTURE CARDS	0				3		1		2
ARAMID	3	1	2		15		11	4	
ARCADENE PROPELLANT	0				0				
ARMY CHAPLAINS	1	1			4		3		1
ARSENALS	5				17				
ARTIFICIAL FOG	1	1			8		5	1	2
ARTIFICIAL INSEMINATION	0				0				
ATMOSPHERIC ABSORPTION	4				179	43			
ATOMIC ENERGY COMMISSION	0				18	17			
ASIAN INFLUENZA	0				1		1		
BAGGAGE	3	1	1	1	10		2	8	
BAKED HAM	1				1			1	
BAKERY PRODUCTS	0				0				
BASEMENT SHELTERS	0				13		12	1	
BATTLEFIELD ILLUMINATION	2	2			12		7	2	3
BENZENE HEXACHLORIDE	0				1		1		
BETA MODELS	0				21	0			
BEVERLY	0				0				
BICYCLES	3	1		2	2		1	1	
BIONIC SONAR	0				3		3		
BLACKOUT	0				33				
BLACK HOLES	3	3			3		2		1
BOMB TESTS	0				188	9	4	5	
BURG MAXIMUM ENTROPY METHOD	0				4		3	1	
C3I	0				2		2		
CARRIER PIGEONS	0				0				
CHAIN GUN	0				6		2		4
CHEMICAL DEMULSIFICATION	1	1			1		1		
CHIRT	0				0				
CLONES	3	2	1		11		2	9	
CODE READING	0				7		3	4	
CODEINE	3	1	2		3		1	2	
CRUDE EMULSIONS	0				0				
D2 PLASMA	0				1			1	
DRAGON	0				32				
EC135C	0				0				

TERMS

T E R M	IDENTIFIERS/OPEN-ENDED				FREE TEXT				
	HITS	REL	MARG	NOT	HITS	STRING	REL	MARG	NOT
ELECTROMETALLURGY	4	3	1		7		4	3	
FALCON MISSILES	0				0				
FISH IMPINGEMENT	0				0				
FLAKE CUTTING	0				0				
FLEET SATELLITE COMMUNICATIONS	0				0				
FLT SAT COM	0				0				
FLYING SQUIRRELS	0				3		1	2	
FOAM IN PLACE	2				19				
FREEBASE	0				0				
FRIENDSHIP	1	1			8		1	3	4
FROGMEN	1	1			2		1	1	
FUNGUS-EATER GAMES	0				0				
GAS GENERATORS	4				92	42			
GAVIONS	0				0				
GEODSS	0				0				
GROYNES	0				0				
H-21C AIRCRAFT	0				0				
HABITAT	0				130				
HARPOON	1				48				
HEART FAILURE	0				15		7	2	6
HELMET ANTENNAS	1		1		0				
HELMET IMAGING AND POINTING SYSTEM	0				2		2		
HIPS	0				3		1	2	
HOSPITAL SHIPS	1	1			2		2		
HOT GOGGLE	0				0				
HOT SPOT SIGNATURES	1		1		1		1		
HYDRA	0				6			5	1
HYPODERMIC SYRINGES	1	1			1		1		
IADT	0				0				
ICE BORING	0				0				
ICEBERG PROJECT	0				1		1		
IFV	0				10		9	1	
IGLOO	0				21				
INFANTRY FIGHTING VEHICLE	1	1			11		7	3	1
INFLATABLE WINGS	0				0				
INFORMATION HIDING MODULES	0				0				
INTEGRATED AUTOMATIC DETECTION AND TRACKING	0				5		3	1	1
ION CONCENTRATION	0				128	28			
J-52-W-16A ENGINES	0				0				
JND GLASS LASER	0				0				
JP-1 FUEL	0				40	0			
KAUAI	0				8		2	6	
KH2PO4	0				3		2	1	

TERMS

T E R M	IDENTIFIERS/OPEN-ENDED				FREE TEXT				
	HITS	REL	MARG	NOT	HITS	STRING	REL	MARG	NOT
KNAPSACKS	1	1			1			1	
KRAKATOA	1		1		0				
LABORATORY RODENTS	0				10		3	6	1
LAND BASED OPERATIONS	1		1		18	1	1		
LASER GUNS	0				10		5	1	4
LASER SCATTERING	4				253	19			
LATRINES	4	4			3		2	1	
LAUNCHING CHUTES	1	1			1		1		
LAUNDRY WASTE WATER	0				10		3	7	
LEAD SULFIDE	0				19	11	6	5	
LEADERSHIP STYLE	6				28	19			
LIGHTNING BUGS	0				0				
LNG TERMINALS	0				2		1	1	
MARK 48 TORPEDO	0				2		2		
MARLINESPIKE SEAMANSHIP	0				0				
MAXIMUM LIKELIHOOD METHOD	1				86	23			
MAYDAY	0				1		1		
METAL CARBONITRIDES	0				0				
MIDSHIPMEN	8	6	2		14		4	6	4
MINE CLIMATOLOGY	0				0				
MINIATURE BALLBEARING	0				0				
MIXED GAS BREATHING APPARATUS	1	1			10		9	1	
MOLASSES	1	1			2		1	1	
MONCOP	0				0				
MONGOLIAN GERBILS	2	1	1		4			4	
MONOGAMY	0				0				
MOONWATCH	0				0				
MOONQUAKES	0				0				
MOPED	1	1			1		1		
MOVING MINES	0				1				1
MUSK OX	0				0				
MX	0				155				
NATIONAL ENVIRONMENTAL POLICY ACT	4		4		8		6	2	
NATIONAL GOALS	11	3	7	1	59	9	4	4	1
NATIONAL GOVERNMENT	8				109	0			
NATIONAL HEALTH INSURANCE	2	2			5		5		
NATIONAL INTEREST	2				72	23			
NERVE GASES	2	2			0				
NEWT	0				1			1	
NUCLEAR CIVIL PREPAREDNESS	1		1		15		13	2	
NUCLEAR POWER	1				275	79			
NUDE MICE	1	1			8		2	6	
NUDET	0				0				
OIL EMBARGO	1	1			21	14	8	2	4

TERMS

T E R M	IDENTIFIERS/OPEN-ENDED				FREE TEXT				
	HITS	REL	MARG	NOT	HITS	STRING	REL	MARG	NOT
OPTICAL BOMBS	0				5		3	2	
PEANUT BUTTER	0					0			
PHASE TRANSITION MATERIALS	0				25	0			
PHOTOVOLATIC SYSTEMS	0				0				
PILING	0				18				
PLANOGRAPH	0				0				
PICTOMAP	0				0				
PRECAST CONCRETE	1		1		13		4	8	1
PRESSURE POINTS	0				93	4	1		3
PINK WATER	6	5	1		17	15	11	4	
RACISM	2	2			8		7	1	
RADAR ECHO	0				54	15	7	8	
RADIATIONS EFFECTS (HUMANS)	2	2			0				
RAFTS	3		2	1	14		10	3	1
RAINFORESTS	3	1	2		1		1		
RARE GAS COMPOUNDS	1		1		2			1	1
RED FUMING NITRIC ACID	0				4		1	3	
RED WATER	6	4	2		59	12	3	9	
RIFLEMANS ASSUALT WEAPON	0				0				
RING CUSP	0				2			2	
RIPCORD HANDLES	0				0				
RIPRAP	17				54				
ROSS ICE SHELF	2	2			3		2	1	
SACCHARIN	2	2			2		2		
SAILBOATS	0				1			1	
SALIMANDERS	0				0				
SALT DOMES	3	1	1	1	0				
SALT MARSHES	22				9				
SAND DUNES	7				16				
SATELLITE DETECTION	4	3	1		51	3	1	2	
SATURN	7		7		13		5	8	
SCIENCE	3				716				
SCHOOL DROPOUTS	0				0				
SCUBA DIVING EQUIPMENT	0				6		5	1	
SCUBA EQUIPMENT	0				8		6	1	1
SEA COWS	1	1			1			1	
SHIP ACCIDENTS	3	2	1		6		6		
SKYCRANE	0				4		2	2	
SOIL LIQUIFICATION	0				0				
SPS-39 RADAR	0				1			1	
SQUIB	0				27				
SSN688	0				2		1	1	
STINGER	0				23				
SUPERTANKERS	3	2	1		0				
SUPERRESOLUTION	0				2		2		

TERMS

T E R M	IDENTIFIERS/OPEN-ENDED				FREE TEXT				
	HITS	REL	MARG	NOT	HITS	STRING	REL	MARG	NOT
TAMBOURINE NUCLEAR DEVICES	0				0				
TANK PERISCOPES	4	3	1		2		1	1	
TAX WRITEOFFS	1		1		0				
TECHNOLOGICAL GROWTH	2	2			33	3	1	2	
TELEPHONE OPERATORS	2	1	1		5		1	2	2
TELEVISIONS PROGRAMS	7	6	1		7		3	4	
THERMAL NOISE	11				98	22			
TIME OF FLIGHT	9				936	76			
TOMATOES	2	2			4		3	1	
TRUMAN DOCTRINE	2	1	1		2		2		
UDMH	0				27				
UNDERGROUND STORAGE	5	3	1	1	32	9	4	5	
UNITED KINGDOM	2				125	119			
UNSYMETRICAL DIMETHYL HYDRAZINE	0				0				
USERS GUIDE	4				138	74			
VENUS ATMOSPHERE	1	1			4		3		1
VIETNAM WAR	15				100	38			
VIOLET	5				64				
VOICE PRINTS	1		1		0				
VOLATILE LIQUIDS	0				8		4	3	1
VOLUNTEER ENLISTMENT	0				21	1	1		
VOTERS	3	2		1	3		3		
WAR PRISONERS	0				29	0			
WARTS	0				1				1
WATER STORAGE	3		2	1	175	8	3	3	2
WEALTH	1				39				
WHEEL CHAIRS	2		2		0				
WHIPPED CREAM	1		1		0				
WINDMILLS	6	6			3		2	1	
WINE	4		4		2			2	
WITCH DOCTORS	0				0				
WOLF PACKS	1	1			1		1		
WORK ENVIRONMENT	3				370	38			
WORLD EVENTS	0				46	5	1	4	
ZAP MISSILES	1		1	0					
ZEBRAS	0				0				
ZIRCON	3	1	1	1	10		6	3	1

END

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